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*Published in:*
International Sociology



*Publication date:*
2007

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*International Sociology* 2007; 22; 367
DOI: 10.1177/0268580907076576

# Imitation and Learning under Uncertainty

## *A Vignette Experiment*


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***abstract:*** Trust is important in organizations, e.g. in teams or small working groups in which the performance of team members depends on the performance of other members in the group and in which team members have only an incentive to perform well if they trust that others perform as well. Existing theories regarding effects of communication on trust problems stress the influence of information about behaviour of potential partners. Effects of *imitation* are less extensively elaborated in the literature. In this article, the authors develop a theory about imitation in combination with other network effects on trust. They propose a distinction between imitation and other types of learning, contrasting trustors who only know that other trustors have been trustful in transactions with a trustee with trustors who also know that this trustee was in fact trustworthy. The theory predicts that both imitation and learning have an effect in trust situations and that these effects depend on uncertainties for the trustor. The authors designed a vignette experiment that enables the distinction between imitation and learning for different levels of uncertainty. The experiment provides strong support for learning effects on trust and some support for imitation effects. There is only limited evidence that the imitation effects depend on uncertainty.

***keywords:*** control ✦ imitation ✦ learning ✦ social networks ✦ trust

## Introduction

Assume you are relatively new in a firm in which projects are often executed in small groups or pairs. Recently, you have been assigned to a project for which you have to do the initial part and you are dependent on the performance of a colleague for the reward you will receive for the end product. If you suspect that your colleague will not do his or her fair share for this project, you prefer not to work yourself because you will not get fair credit for your efforts anyway. If you trust that your colleague will

International Sociology ✦ May 2007 ✦ Vol. 22(3): 367–396

SAGE (Los Angeles, London, New Delhi, and Singapore)
DOI: 10.1177/0268580907076576

work hard, you are prepared to work hard yourself as well. The problem described here has the structure of a trust problem as we define it in more detail later in the article. Trust is clearly essential for the performance of the focal actor and, if this type of trust problem occurs regularly, for the performance of the firm as a whole. Costa et al. (Costa et al., 2001; see also Costa, 2000) have already shown empirically that trust is related to performance in teams. Dirks (1999) provides experimental evidence for the relation between trust and performance, at least if team members are motivated to perform their tasks well.

Trusting colleagues is especially difficult for an employee who is new in a firm and is uncertain about what to expect from his or her colleagues. Such a person might be inclined to build in some additional control on colleagues to make sure that they do their jobs properly. Alternatively, he or she might look at how other colleagues solve their trust problems and adapt his or her behaviour accordingly, even if it is unclear whether the behaviour of others is effective in terms of reaching mutually cooperative behaviour. This brings us to the sociological angle on this topic, namely, how social networks affect trust in situations as described earlier.

The idea that social embeddedness promotes trust is well known and accepted in sociology (Granovetter, 1985). Existing theories address the importance of social networks, hypothesizing effects of reputation (Raub and Weesie, 1990), learning and control (Buskens and Raub, 2002) and gossip (Burt, 2001; Burt and Knez, 1995). Nevertheless, these theories do not account for all network mechanisms affecting individual decisions in trust problems. Particularly, we believe that effects of *imitation* on trust problems are largely neglected. By imitation we refer to situations where actors facing a trust problem base their decision upon observing behaviour of other trustors in similar conditions. If several other trustors trust a certain trustee their behaviour can be perceived as a signal that trust can be placed safely, even though it is unknown whether this trustee honours trust. In other words, sometimes individuals decide to trust somebody just because they see others do so. Imitative behaviour is traditionally considered a form of social learning that plays an important role in the socialization process (see, for example, Bandura and Walters, 1963: Ch. 2). Imitation might be performed if it is seen as the most convenient way to arrive at a better decision, especially when accurate information is not easily available, and, in this specific sense, imitation can be viewed as a sensible and even rational behaviour (see Hedström [1998] on 'rational imitation'). This does not exclude the possibility that imitation can have perverse effects. If actors realize that their partners' best option is to base their decision on behaviour of similar others without knowing outcomes, there will be more room for opportunistic behaviour compared to situations where outcomes can be observed as well. This article studies imitation and other types of learning

in trust problems. Some empirical evidence for the importance of imitation is provided by means of a vignette experiment that tests hypotheses about imitation and other types of learning under different conditions.

We now define what we mean by a trust problem more precisely. In line with Coleman (1990: Ch. 5), we conceive a trust problem as an interaction involving two interdependent actors with the following properties:

1. The opportunity for one actor (*Ego*) to place some resources at the disposal of another actor (*Alter*) who has the option to honour or abuse trust.
2. A structure of preferences such that Ego prefers to place trust if Alter is trustworthy, but regrets placing trust if Alter is untrustworthy; while for Alter abusing trust is preferred over honouring, but honouring trust is preferred over a situation in which trust is not placed.
3. There is no formal guarantee that protects Ego from the possibility that Alter abuses trust.
4. There is a time lag between the decision of Ego and the action of Alter. The strategic risk is caused either by these 'time asymmetries' (Coleman, 1990: 91) between the decision of Ego and Alter, or by information asymmetries about the object of the transaction (Kollock, 1994), or more generally, the strategic risk is generated by the actors' interdependence (Raub and Weesie, 2000).

In game-theoretic terms, a simple trust problem between a pair of actors can be represented in the extensive form presented in Figure 1, which is also known as the *trust game*, or TG (Camerer and Weigelt, 1988; Dasgupta, 1988; Kreps, 1990). This formalization captures the essential features of the problem. The game begins with a move by Ego, who has a choice between trusting and not trusting Alter. If Ego withholds trust, the game ends. In this case, Ego receives $P_E$ and Alter receives $P_A$. If Ego chooses to place trust, Alter has the possibility to honour or abuse that trust. If Alter honours trust, he obtains $R_A > P_A$ and Ego obtains $R_E > P_E$, while if he abuses the trust Alter receives $T_A > R_A$ and Ego is left with $S_E < P_E$.[1] This game can be seen as a one-sided version of the well-known Prisoner's Dilemma. For this reason we use the same notation for the payoffs that is normally used for the Prisoner Dilemma, where $T$ stands for temptation, $R$ for reward, $P$ for punishment and $S$ for the sucker's payoff. The standard game-theoretic prediction is that Ego will not trust in a one-shot TG. If Ego places trust, Alter will abuse it because $T_A > R_A$. Consequently, Ego knowing the payoff structure should withhold trust because $P_E > S_E$. This is the subgame perfect equilibrium (in Figure 1 represented by double lines). The payoffs in equilibrium are therefore $P_E$ and $P_A$. This outcome is suboptimal, because both actors would prefer the payoffs yielded in the situation in which trust is placed and honoured, $R_E$ and $R_A$.

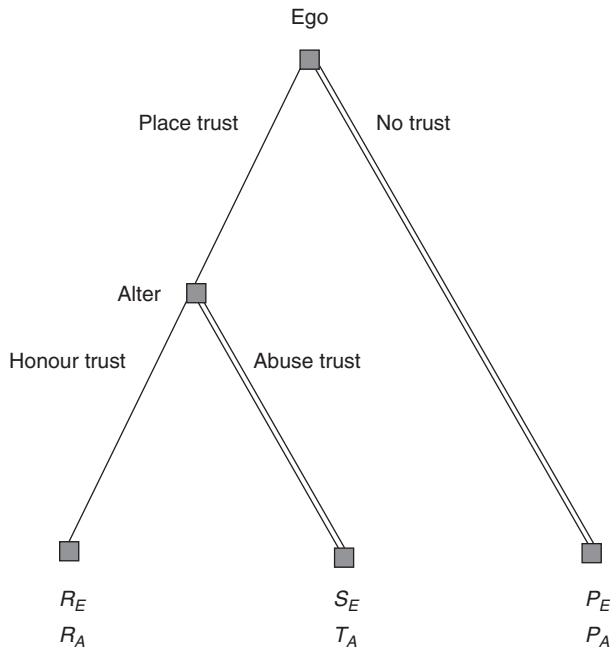


***Figure 1*** *Trust Game ($R_E > P_E > S_E$; $T_A > R_A > P_A$)*

This formalization of the TG resembles an isolated encounter between two isolated actors, but a single encounter between two actors is too simplistic to account for the real complexity of human transactions. Transactions between pairs of actors are often embedded in a complex system of social relation (Granovetter, 1985) which promotes trust, reducing the risk derived from interdependence (Raub and Weesie, 2000). In addition, actors are seldom perfectly informed on the incentives of the other actor. There might be uncertainty on, for example, whether or not the other actor is actually able to do his or her part of the job well even when he or she is trying.

In the second section, we elaborate on the distinction between imitation and learning. We present theoretical arguments about mechanisms through which embeddedness affects trust under uncertainty. The third section of the article presents a vignette experiment that provides evidence of network effects in a specific trust problem. The experiment is designed to define specific conditions such as uncertainty that could facilitate imitative behaviour. The section describes the experimental set-up and the methods of analysis. In the fourth section we present the results

of the empirical analysis. The final section presents conclusions and identifies possibilities for future research.

## Theory

First, we introduce another example of a trust problem that will provide a frame for the theoretical model as well as a suitable scenario for the experiment (see Appendix). Imagine a student (Ego) who has the idea of starting an e-business. The investment requires an initial capital of about €5000, but Ego has only €3000 available. This money is not sufficient to realize the investment in time. Within her cohort there is another student (Alter), who is a stockbroker. Alter is known to make money investing small amounts on the stock market. Alter offers Ego the possibility to invest her money in the stock market in order to obtain the capital for the e-business. In exchange, Alter asks for 10 percent of the profit, but he does not share the losses if the investment fails. Since Ego does not have the competence to invest alone, Alter has the possibility to lie about the outcome of the investment and keep (part of) the profit he made for himself. This scenario displays all essential features of a trust problem as defined in the introduction. Ego prefers to invest her money if Alter is trustworthy, but to keep the money and renounce the e-business if Alter is untrustworthy. Alter, on the other hand, realizes a greater gain by abusing trust, but prefers honouring trust to the case in which trust is not placed. The scenario has two additional desirable characteristics. First, the stock market accounts for the type of uncertainty that we are trying to model. Second, it provides a setting that is realistic enough to use as a frame for our experiment.

Now, we elaborate on the importance of embeddedness for trust. Note that these theoretical arguments are not restricted to trust problems in teams within organizations, but generalize to a variety of trust problems including, for example, alliance formation among firms and buyer–supplier relations (see Buskens et al., 2003). We elaborate on the validity of the experimental test for different applications in the conclusion.

We distinguish two dimensions of embeddedness: first, Ego and Alter can face the same trust problem repeatedly, and, second, Ego can have relations with other actors who had or have similar trust problems with Alter (for a more general discussion of this issue, see Raub and Weesie, 2000). We refer to the first dimension as *dyadic* embeddedness and to the second as *network* embeddedness. Dyadic embeddedness can enforce cooperation, casting a shadow on the future that discourages opportunistic behaviour (Axelrod, 1984), or it can lead actors to trust each other more easily if they have a history of past cooperative relations (Gautschi, 2000). Network embeddedness represents the possibility that actors are not only

involved in bilateral transactions, but also have contacts with third parties. Information about trustworthiness of actors circulates in the network, determining the emergence of reputation (Raub and Weesie, 1990). Buskens and Raub (2002) distinguish two mechanisms through which dyadic and network embeddedness induce cooperation: *learning* and *control*. Learning refers to changes in Ego's trust in Alter depending on information about past performance of Alter either from Ego's own experiences or from third-party experiences. Learning effects are stronger for networks where information circulates faster (see Buskens, 2002: Ch. 4; Buskens and Yamaguchi, 1999). Clearly, Ego's trust increases if information about Alter is positive, and decreases if information about Alter is negative. Control is based on Alter's anticipation of future sanctions for abuse of trust (see Buskens and Weesie [2000a] for a game-theoretic model about control effects through social networks).[2] The larger the potential sanctions for Alter if Ego does not trust Alter anymore or if Ego damages Alter's reputation by informing third parties about an abuse of trust, the less likely Alter will abuse trust. Consequently, Ego can trust Alter better as a result of this control mechanism if her sanction potential is larger after a possible abuse of trust by Alter.

In this article, we elaborate on the framework mentioned earlier by adding imitation as a third mechanism. In order to study the role of imitation in supporting trust and compare this with learning, we first elaborate on some existing theories with respect to learning. Learning mechanisms have been studied and modelled by several scholars. Actors adapt their choices depending on information they receive that is relevant for the decision they have to make. This information can come either from one's own experience or from experiences of others who have to make similar decisions. In such models, actors look at their own past and repeat choices that proved to be successful (Macy, 1990), or they update their behaviour after observing the (or a sample of) choices made by others and the outcomes that these actors obtained (e.g. Ellison and Fudenberg, 1995; Erev and Roth, 1998).

Some economics scholars who developed these learning models (Pingle, 1995; Pingle and Day, 1996; Schlag, 1998) use the label 'imitation' for models in which individuals decide after receiving information about the outcomes obtained by others and compare them employing some efficiency criteria. Yet there are situations in which these learning models do not apply. For instance, if actors can observe other people's behaviour but not their payoffs, existing models do not make predictions about the effects this kind of information has on the behaviour of Ego. Such decision problems have been largely neglected in the literature.

In this article, we focus precisely on this type of decision with respect to trust problems. From now on, we use the label 'learning' for any decision

based on information that *includes* the outcomes of a given transaction. The term 'imitation' is restricted to situations where individuals base their decisions on the behaviour of others who are in a similar position as Ego, i.e. they are also trustors, *without* having any information about the outcomes obtained by these others. This definition is inspired by psychological definitions of imitation (see Byrne and Russon [1998] on some of the definitional controversies within psychology), focusing on copying behaviour while explicitly excluding a reinforcement argument, namely, that the behaviour is copied *because* it leads to desirable results.

Moreover, Ego might observe behaviour of third parties in relation with even 'fourth' parties and base her decision on this information. To distinguish clearly between these different types of third parties, we introduce the label 'Other Egos' for third parties who have transactions in a similar role as Ego, i.e. they also have to decide whether or not to trust someone else. We use the label 'Other Alters' for third parties that are in a similar role as Alter and with whom Other Egos have been involved in trust problems.

Situations in which actors observe behaviour of others and then choose a strategy are not difficult to imagine, but also situations in which information regarding choices made by other individuals would not be sufficient are conceivable. When deciding whether to trust a colleague on a collaborative effort, we observe how many other people trust him or her in order to have a clue. When deciding whether to confide in somebody about some serious personal problems, we would presumably consider the number of others that confide in him or her irrelevant, especially if we do not know whether that person was trustworthy or not. It is hence plausible that some *conditions* facilitate imitation in trust problems and others hinder it. Generally speaking, we might expect imitation to take place preferably in relatively unfamiliar situations (see Pingle, 1995; Podolny, 1993, 2001) and in situations in which an eventual abuse of trust is not 'life-threatening'.

More precisely, we expect imitation as well as learning to be associated with uncertainty (Podolny, 2001). We claim that individuals facing trust problems in which they are uncertain about the possible outcomes will imitate others especially when adaptive learning is difficult and better information is not available (Nooteboom, 2002: 5–8). In our example of the student who lets a fellow invest her money in the stock market, we distinguish two types of uncertainty:

*Partner uncertainty* is uncertainty for Ego about the abilities of Alter to obtain a good outcome for Ego even if he tries to act trustworthily.

*Market uncertainty* is the uncertainty for Ego that Alter will reach a good profit even if he tries to act trustworthily *and* he is able to do so.

In terms of the example, the first type of uncertainty refers to how competent Alter is as a stockbroker. The second type of uncertainty refers to the

situation that Alter loses the money of Ego due to unforeseeable circumstances. Even if Alter is doing everything in the right way, investments might go wrong and Ego loses her money. In this situation, the student will always be uncertain about the causes of her misfortune because she cannot distinguish between actual untrustworthy behaviour of the stockbroker, just unintended suboptimal investments or unforeseeable circumstances.

Given that Ego is uncertain about the capacities of Alter but also about the functioning of the market as a whole, it is important for her that Other Egos have good experiences with Alter and even that Other Alters are doing well because this indicates that it is possible to make a good profit with stock market investments. And, if information about the actual outcomes of certain investments is unknown, it will be reassuring that Other Egos are involved in similar types of transactions. This leads to the following set of testable hypotheses about the effects of learning and imitation.

*Hypothesis 1 (partner uncertainty):* The less information Ego has about the capacities of Alter, the less trustful Ego is.

*Hypothesis 2 (network learning):* The more information Ego has received from Other Egos that Alter or Other Alters were trustworthy in past transactions with Other Egos, the more trustful Ego is.

*Hypothesis 3 (imitation):* The more Ego knows that Other Egos trusted Alter or Other Alters, the more trustful Ego is.

Clearly, we would expect negative effects on trust if Ego has negative experiences or receives negative information, but we will not test these hypotheses in the vignette experiment discussed later.

The theoretical models on which our hypotheses are based (Buskens, 2002) predict also an effect of learning from dyadic embeddedness (i.e. information on previous trust problems between Ego and Alter). Other studies have included variables accounting for this effect in terms of a common past between Ego and Alter (Barrera, 2005; Buskens, 2002; Gautschi, 2000). These variables represented the history of the relation between the two focal actors and the effects of these variables generally supported the learning hypothesis. However, in our experiment we do not want to consider the case in which Ego and Alter have a common past for the following reason. We expect that, consistent with the earlier findings, Ego's own common past with Alter has such a strong effect that it obscures the network effects that are the focus of this article. For example, if Ego has already made stock market investments with Alter, she hardly needs to learn from the network or to imitate Other Egos, for she can decide primarily on her own experience. In an experiment such as the one described later, it is always preferable to restrict the number of variables that are varied. Therefore, we will not test the hypothesis on learning

from dyadic embeddedness in this article. For the same reason, we will also not test the hypothesis on dyadic learning about Other Alters.

Since network learning refers to more complete information than imitation, we expect learning effects to be larger than imitation effects when there is both information referring to Alter and information referring to Other Alters.

*Hypothesis 4 (learning vs imitation):* The effect of learning about trustworthiness of Alter (Other Alters) is stronger than the effect of imitation of trustfulness towards Alter (Other Alters) for information about similar transactions.

As explained in the theory, we expect the effects of information to be more important if uncertainty is larger, i.e. (1) if uncertainty about Alter's capacities is larger, information about Alter is more important and (2) if Ego has less knowledge about the market all information about interactions of Alter as well as Other Alters is more important.

*Hypothesis 5:* The effects of information that concerns Alter (i.e. Alter's trustworthiness and Other Egos' trustfulness towards Alter) are larger if the uncertainty about the capacities of Alter is larger.

*Hypothesis 6:* All effects of network learning and imitation are larger if Ego has less knowledge about the market.

Furthermore, we provide a test for control effects in this experiment. As indicated earlier, the existence of a common future creates sanction possibilities for Ego after an abuse of trust. Moreover, the faster Ego can inform third parties about an abuse of trust of Alter, the larger Alter's loss after an abuse of trust and thus the less likely it is that Alter will abuse trust. Hypotheses on control effects have been tested in another vignette experiment (Buskens and Weesie, 2000b), but the framing of that experiment exposed the results to some criticism concerning the interpretation of the variables operationalizing control effects. In the present design we tried to overcome these criticisms, using a frame in which the effective social network is better defined. The students' cohort provides a specific network in which presumably each member knows all other members.[3] Therefore, the following two hypotheses on control effects closely resemble analogous hypotheses presented in the Buskens and Weesie (2000b) experiment, but the operationalizations allow less alternative interpretations of the effects.

*Hypothesis 7 (dyadic control):* The more transactions Ego and Alter expect to have in the future, the more trustful Ego is.

*Hypothesis 8 (network control):* The more Ego is able to inform Other Egos and the denser the network among Egos, the more trustful Ego is.

## Method

Imitation as a mechanism for actors to solve trust problems is not easily observable in real life, because it relies on mental processes that are intrinsically difficult to observe. Although some empirical evidence of *mimic trust* from 'real-life' data is available (Wittek, 2001), experimental data are particularly suitable, for they can reproduce simple situations in which actors are required to make choices given very little – but very well specified – information about a choice situation. Precisely for this reason, we realized a vignette experiment in which we vary the kinds of information that distinguish imitation from other types of learning. Vignettes are simple descriptions that sketch hypothetical situations reproducing real-life problems. Respondents are selected voluntarily and asked to imagine how they would solve the dilemma that is depicted in the vignette. Rossi and his colleagues introduced vignette experiments in sociology in the 1970s (for an overview of their research, see Rossi and Nock, 1982). Recently, vignette experiments have been applied to study economic transactions (Buskens and Weesie, 2000b; Rooks et al., 2000). We opted for a design similar to that applied by Buskens and Weesie. In their experiments they presented pairs of vignettes with different characteristics to respondents and asked them to give a simple preference for one vignette out of each pair. This method is called paired comparison. Assuming that subjects find it easier to express a preference for a vignette out of a pair rather than rate several vignettes according to their preferences, we expect choices with paired comparison to be easier for the subject and to provide more realistic results, especially when differences between options are rather subtle.

### *The Scenario*

A vignette experiment typically begins with a scenario that provides the 'frame' for the actor's decision. Subsequently, the actor has to evaluate a series of vignettes in which crucial information is varied. The scenario must reproduce a trust situation in which actors choose under uncertainty, and the independent variables of the vignettes should include information giving room to learning and imitative behaviour. In our scenario, Ego is a student and the cohort that attends university classes with Ego provides network embeddedness. The experimental network is imaginary, but it refers to an existing group to which Ego belongs, which provides the subject with a realistic and effective network of informants. It should be relatively easy for subjects to imagine themselves in the hypothetical situation because the subjects are students at a Dutch university from the same cohort.

In our experiment it is hypothesized that Ego needs some money to set up an e-business, and it is important that she realizes this investment quickly not to lose the opportunity. Alter is a schoolmate of Ego who is a

stockbroker. There is a possibility for Ego to let Alter invest her savings on the stock market in exchange for 10 percent of the potential profits. The trust problem arises from asymmetry in the information available to Ego and Alter: Alter knows the probability that he can realize the profit. Moreover, assuming that Ego is unable to monitor the profits, Alter has an incentive to claim that the investment was unsuccessful while it was actually successful, which gives him an additional profit, since he does not share potential losses. Some details are emphasized in the instructions to make the story more concrete: Ego wants to conclude the business as quickly as possible, she needs €5000 as initial capital and she only has €3000; a loan from the parents or from a bank is not an available option. We decided to use the example of the stock market in our experiment for two reasons. First, the stock market accounts in a credible way for the possibility that the transaction yields a negative outcome for Ego, even if Alter has the will to perform well. Second, the scenario was particularly realistic for the students who participated in the experiment because they were studying IT management and economics. According to their professor, they were expected to have a certain familiarity with the type of problems described in our experiment, because the students had to think about initiating an IT investment for one of the assignments in the course in which this experiment was done. The English translation of the text that was presented to the students as the 'scenario' and the 'task' can be found in the Appendix.

Vignettes are presented to the subjects in pairs and vary with respect to key characteristics of embeddedness and uncertainty. In order to make the comparison easier, the vignettes are presented as referring to two different Alters with different characteristics.[4] Subjects are instructed that two schoolmates in their cohort are known as expert stockbrokers (Jansen and de Vries).[5] This expedient only serves the purpose of facilitating the imaginary choice to the subjects associating the characteristics to two different persons.[6] Figure 2 presents an example of a pair of vignettes between which actors had to choose.

### *Independent Variables*

Independent variables are the characteristics that are listed at the vignettes. We assume that the subjects choose according to the utility they associate with each vignette. The characteristics that are varied in the vignettes should refer to those aspects of a trust problem that are indeed relevant for an actor's decision in similar situations. Six characteristics are varied: three for network embeddedness (information available to *Ego*, *Outdegree* and *Density*), one for dyadic embeddedness (*Future*), one for uncertainty (*Partner Uncertainty*) and one for the city where Alter studied finance (*City*). Table 1 shows the specific formulations of all vignette variables.

| Jansen | De Vries |
|---|---|
| • You do not know the educational background of Jansen.<br>• Jansen will move to a foreign insitute to finish his studies soon after the results of your investment are known. | • De Vries studied finance in Zwolle at college level.<br>• De Vries will continue his studies at this university. |
| • Jansen and his friends from the cohort meet regularly outside university. | • De Vries and his friends from the cohort meet rarely outside university. |
| • You know that other students in your cohort have done similar investments with people other than Jansen and they had good results. | • As far as you know, no other students in your cohort have ever done similar investments with de Vries or with anybody else. |
| • You have friends in common with Jansen. | • You have friends in common with de Vries. |
| Which student would you let invest your money on the stock market? | |
| ❑ Jansen | ❑ De Vries |

***Figure 2*** *A Pair of Vignettes*

*Partner Uncertainty* represents uncertainty about Alter's capacity to honour trust. Assuming that education in finance increases one's competence about the stock market, this variable is operationalized as previous formal education in finance, with two categories: previous education in finance versus no information about previous education. Alter's temptation to abuse trust decreases if his competence increases. In addition, Ego will perceive higher uncertainty about Alter if she has no information about Alter's competence, and lower uncertainty if Ego knows that Alter has previous education in finance. *Partner Uncertainty* takes the value 1 when no information is provided about the previous education of Alter, and 0 when Alter had formal education in finance. The category 0 is split into two subcategories that vary with respect to the city where Alter got his degree. This supplementary variation refers indeed to a different variable, *City*, which is discussed next. We decided to incorporate the variable *City* into *Partner Uncertainty* in order to reduce the total number of descriptions of characteristics in the vignette.

*City* varies with respect to the city where Alter obtained his degree in finance. One objection against an experimental set-up such as the one we propose here is that variation in any variable produces significant effects on the dependent variable, because subjects react in some way consistently to the variations the experimenters come up with. In order to

***Table 1*** *Description of the Variables in the Vignette Experiment*

| Variable | Value | Text |
|---|---|---|
| *Partner Uncertainty* | 0 | Jansen (de Vries) studied finance in Zwolle (or Den Bosch) at college level. |
| | 1 | You do not know the educational background of Jansen (de Vries). |
| *City* | 0 | Jansen (de Vries) studied finance in Zwolle at college level. |
| | 1 | Jansen (de Vries) studied finance in Den Bosch at college level. |
| *Future* | 0 | Jansen (de Vries) will move to a foreign institute to finish his studies soon after the results of your investment are known. |
| | 1 | Jansen (de Vries) will continue his studies at this university. |
| *Density* | 0 | Jansen (de Vries) and his friends from the cohort meet rarely outside the university. |
| | 1 | Jansen (de Vries) and his friends from the cohort meet regularly outside the university. |
| *No Information* | 0 | As far as you know, no other students in your cohort have ever done a similar investment with Jansen (de Vries) or with anybody else. |
| *Other Egos' Trustfulness vs Other Alters* | 1 | You know that other students in your cohort have done similar investments with people other than Jansen (de Vries) but you do not know the outcome. |
| *Trustworthiness of Other Alters* | 2 | You know that other students in your cohort have done similar investments with people other than Jansen (de Vries) and they had good results. |
| *Other Egos' Trustfulness vs Alter* | 3 | You know that other students in your cohort have done similar investments with Jansen (de Vries) but you do not know the outcome. |
| *Trustworthiness of Alter* | 4 | You know that other students in your cohort have done similar investments with Jansen (de Vries) and they had good results. |
| *Outdegree* | 0 | You do not have any friends in common with Jansen (de Vries). |
| | 1 | You have friends in common with Jansen (de Vries). |

challenge this criticism, we decided to include in our design an 'irrelevant' variable to test whether this variable produces any effect on the choices of the subjects. We opted for the city where the partner attended high school, because this seemed a feasible variable from which we do not expect any effect. The two towns (Zwolle and Den Bosch) are two middle-size relatively anonymous Dutch towns and we are not aware of any significant difference in the quality of their programmes, hence we do not expect any preference for one or the other.

*Future* indicates whether Ego and Alter have a common future. It takes value 0 if Alter is going to leave the university soon after his transaction with Ego is finished and 1 if Alter is not going to leave. *Future* is a variable of dyadic embeddedness, which induces control effects (Buskens, 2002). The 'shadow of the future' (Axelrod, 1984) provides Ego with opportunities to sanction Alter in case trust is abused. Even if it is less plausible that Alter and Ego have more similar transactions in the future, some other form of control, for example, through social sanctions, is plausible in the given context. In the Buskens and Weesie (2000b) experiment, this variable took value 0 if *Ego* was going to leave, but this formulation was more problematic. For example, the assumption that Alter knows that Ego is about to leave was not very realistic in that scenario, and nevertheless this assumption is necessary for potential sanctions to be effective.

*Density* indicates the closure of the common network. *Density* has value 1 if Alter and the other members of the cohort meet regularly outside the university, while *Density* equals 0 if they seldom meet. *Density* induces both control and learning effects, because information spreads more quickly in a denser network allowing actors to learn about each other and also to sanction defections.

Other Egos provide Ego with information about Alter's competence or about the population of potential Alters. Actors that can provide this information to Ego are Other Egos who have been involved in similar trust problems with Alter or with Other Alters. This information allows Ego to learn or imitate. The related variable has five categories according to different types of information provided (Table 1). The categories will be transformed into four dummy variables in the analysis, with 'no information' as the reference category. Category 4 provides Ego with information about trustworthiness of Alter (*Trustworthiness of Alter*): Ego knows that Other Egos did the same type of investment with Alter successfully. In this case, information is specifically about the behaviour of Ego's partner. The formulation is very similar to the one used in previous experiments (Buskens and Weesie, 2000b). Category 3 refers to Alter, but information is less specific. Category 3 provides Ego with information about trustfulness of Other Egos vs Alter (*Other Egos' Trustfulness vs Alter*): Ego knows Other Egos did the same type of investment with Alter but she does not know whether the investment was successful or not. The

information provided here informs Ego about the extent to which Other Egos trust Alter for similar trust problems. A decision based on this type of information leads Ego to imitate Other Egos. In categories 2 and 1, information refers to the same type of trust problem, but involving Other Alters. Category 2 provides Ego with information about trustworthiness of Other Alters (*Trustworthiness of Other Alters*): Ego knows that Other Egos did the same deal with somebody other than Alter and the investment paid back. The partner is different, but the trust problem is exactly the same. Ego can learn from this type of information, how often this type of transaction was successful in general. Category 1 provides Ego with information about trustfulness of Other Egos vs Other Alters (*Other Egos' Trustfulness vs Other Alters*): Ego knows that Other Egos did the same type of investments with other partners, but she does not know whether these investments turned out successfully. In other words, Ego is informed about the extent to which other people do this type of investment through a partner. As for category 3, the effect of this type of information on Ego's decision is an effect of imitation. Category 0 refers to the situation in which Ego has no information available from the network about this trust problem with the same or a different partner. Summarizing, the information available to Ego presented in the fourth description in the vignette varies along two dimensions: first, Ego receives information about transactions involving the same partner or different partners; second, information includes or does not include the outcomes of these transactions.

*Outdegree* refers to common acquaintances in the network. It takes value 1 if Ego has some friends in common with Alter and value 0 if Ego has no friend in common with Alter. As for *Future*, *Outdegree* mainly induces control effects; in fact Ego has the opportunity to sanction Alter, damaging his reputation with the friends. As for *Future*, this operationalization is more satisfactory than the one proposed by Buskens and Weesie (2000b). It refers to friends within a well-defined network, which makes it plausible to assume that Alter is concerned about consequences of his behaviour in the transaction with Ego on his reputation with the other cohort fellows.

### *Subject Characteristics*

Although evidence of how characteristics of actors correlate with trust is extensive in the literature (see Snijders [1996] for a review), payoffs are more important than individual characteristics in isolated trust problems. Because we apply paired comparison, subject characteristics do not vary within these choices, and there is no reason to expect that subjects prefer 'de Vries' to 'Jansen' or the other way round. Therefore, subject characteristics can only matter in the sense that some subjects find it more important to know that Alter performed well in the past with Other Egos, while other subjects find it more important that Alter does not leave the country soon after the transaction is finished. This implies that subject characteristics can

have effects only in interactions with the independent variables at the vignettes. The only subject characteristic for which we have derived such hypotheses in the theory section is *stock market knowledge*. Nevertheless, to exclude other possible differences between subjects, we included a small questionnaire at the end of the experiment to check that choices indeed do not depend on these individual characteristics.

If Ego has some knowledge about the stock market, she can reasonably estimate the risk connected with the described investment, and uncertainty will then be related mainly to Alter's capacity to be successful at the stock market. In order to estimate Ego's knowledge, subjects were asked how familiar they were with the stock market and whether they were able to operate on the stock market themselves. Answers were given on a four-point scale (0 = not familiar at all; 1 = some basic knowledge, but not familiar; 2 = some information but do not know how to operate; 3 = familiar enough to invest on the stock market). Other questions about expertise on economic issues regarded frequency of reading economic newspapers and economic pages, and educational background in economics (Yes/No). As the subjects' expertise on economic issues is crucial for our hypotheses, it seemed preferable to also have some more 'objective' measures for this expertise. Therefore, subjects were asked to estimate the value of the AEX (Amsterdam Exchange Index), Dow Jones and the exchange rate of the US dollar/Dutch guilder on the day before the experiment and the highest value over the last 12 months for all three indices. In addition, we asked them how sure they were about each of these estimates. Subjects were also asked to rank the following types of economic investment by 'risk': shares, options, bonds and stock options. Although subjects, on average, were not very knowledgeable about most of these issues, all issues provided some information about their knowledge. We tried to construct an index for stock market knowledge using different combinations of these variables, and eventually we opted for the solution that seemed to summarize this information most accurately. We ran a factor analysis, using principal axis factoring, of the following variables: self-assessment of familiarity with the stock market, self-confidence with the answers about estimates of indices such as AEX and Dow Jones, actual errors in these estimates and correctness of the answers to the ranking of investments by risk. The results indicate that the answers to this set of questions are better explained by a one-factor solution, the Eigenvalues of the first two factors being respectively 3.405 and 0.541. Therefore, the standardized score of the first factor obtained with this analysis was used as an index of stock market knowledge (*Knowledge*).[7]

Now, we describe the other subject characteristics in the questionnaire. *Personal characteristics* included age, sex and size of the place of residence. *Birthplace* and *place of residence* are included because the preference for the

city in which Alter studied finance might be affected by Ego's birthplace or place of residence. *Religious affiliation* was included for the same reason, because the high school in Zwolle is confessional. Subjects were also asked how realistic they perceived the choice they had to make, and how difficult it was for them to imagine the situation described on a five-point scale (0 = absolutely unrealistic/difficult; 1 = pretty unrealistic; 2 = possible but unlikely; 3 = realistic; 4 = absolutely realistic) to check whether subjects who had more difficulty to position themselves in the choice situations made different choices from subjects who did not have this difficulty. Related to this, we built in some controls to compare the scenario with the actual situation of the subjects. *Availability of resources* was measured by asking for the subject's possibility of borrowing money (and from whom) and availability of money required for the investment. *Network parameters* for the cohort of subjects were measures comprising five questions, including the *degree* of the subject (How many friends are there in your cohort with whom you speak about personal problems? How many persons does your cohort consist of?) and the *density* of the real network (How often have your cohort fellows met outside the university in the last three months? How often did you join in these meetings?). Finally, *risk aversion* is measured to test whether risk-averse subjects find some aspects of embeddedness more important than others, because risk aversion can affect cooperative behaviour in social dilemmas (Raub and Snijders, 1997). Moreover, our scenario implies a certain hazard that might vary with individual risk aversion. Risk preference was assessed using lotteries and probabilities equivalence questions (Donkers et al., 2001) based on Prospect Theory (Kahneman and Tversky, 1979).[8] The hypotheses to be tested with the variables included in the experiment are summarized in Table 2.

### *Experimental Design*

A first choice in the design of the experiment regards the number of pairs that has to be presented to each respondent. In order to avoid boredom and loss of concentration, we decided to limit the number of pairs for each subject to 10. Given that vignettes consist of three variables with two categories each, one with three categories and one variable with five categories, there are $3 \times 2 \times 2 \times 2 \times 5 = 120$ different vignettes, and hence $(120 \times 119) / 2 = 7140$ different pairs (variables may be constant within pairs). This is the universe of possible pairs from which we chose a sample. We excluded a number of pairs from the set of possible pairs, because for these we considered the choice to be too obvious. For example, a comparison between two vignettes with *Future* = 1 and *Future* = 0, ceteris paribus, seems less interesting as everybody would presumably prefer a partner with whom she has a common future *(Future* = 1*).* We reduced the number of feasible pairs to unordered pairs in the sense of Pareto ordering,

***Table 2*** *Hypotheses on Attractiveness of a Vignette*

| Hyp. | Independent variable | Expected sign of the coefficient |
|---|---|---|
| 1 | *Partner Uncertainty* | – |
| 2 | *Trustworthiness of Alter* | + |
| 2 | *Trustworthiness of Other Alters* | + |
| 3 | *Other Egos' Trustfulness vs Alter* | + |
| 3 | *Other Egos' Trustfulness vs Other Alters* | + |
| 4 | *Trustworthiness of Alter > Other Egos' Trustfulness vs Alter* | |
| 4 | *Trustworthiness of Other Alters > Other Egos' Trustfulness vs Other Alters* | |
| 5 | *Partner Uncertainty × Trustworthiness of Alter* | + |
| 5 | *Partner Uncertainty × Other Egos' Trustfulness vs Alter* | + |
| 6 | *Knowledge × Trustworthiness of Alter* | – |
| 6 | *Knowledge × Trustworthiness of Other Alters* | – |
| 6 | *Knowledge × Other Egos' Trustfulness vs Alter* | – |
| 6 | *Knowledge × Other Egos' Trustfulness vs Other Alters* | – |
| 7 | *Future* | + |
| 8 | *Outdegree* | + |
| 8 | *Density* | + |
| – | *City* | 0 |

excluding pairs for which one vignette has only advantages and no disadvantages compared to the other vignette.[9] As a consequence of this restriction, accepted pairs of vignettes vary in at least two independent variables. The variable related to information available to Ego has five categories, which implies 10 combinations of two different values. Each combination occurs exactly once within the set of vignettes for each subject. We excluded pairs of vignettes that did not vary for this variable. Pairs in which *City* = 1 in both vignettes are also excluded.[10] These restrictions dropped the number of possible pairs to 1700. Variables that are constant within each pair were displayed anyway in order to enable testing hypotheses on interaction effects with these variables. Each vignette was assigned randomly to the left or right side of the pair. The order of variables on each vignette was always the same. Subjects were asked first to choose which vignette within a pair they preferred. After this choice, the subjects were asked to state how strong their preference was on a four-point scale: 1 = very weak; 2 = weak; 3 = strong; 4 = very strong.[11]

## Analysis

For the statistical analysis of paired comparison we apply a random utility model (McFadden, 1973). This model assumes that subjects attach a certain utility ($u$) to each vignette, depending in a linear manner on its attributes ($z$) plus a random component ($\varepsilon$). This random component is included to account for the residual part of the utility that does not depend linearly on the attributes of the vignettes. Formally, $u(z) = z'\beta + \varepsilon$.

Subjects are assumed to choose the vignette with the highest utility and this choice depends on the differences between attributes of each pair of vignettes. The probability that one vignette is preferred over the other can be estimated applying a probit model in which the differences between the values of the variables of the two vignettes are used as independent variables. The coefficients $\beta$ can be interpreted as the effects of one-unit differences in each of these variables on the attractiveness of a vignette. Since independent variables are treated as qualitative attributes of the vignettes, the coefficients can be compared but their size is not straightforwardly interpretable. Moreover, since the independent variables are differences between attributes of vignettes, effects for variables that do not vary within pairs of vignettes, such as subject characteristics, are not identified in the statistical model. Therefore, due to the method of pairwise comparison, we cannot estimate main effects of subject characteristics such as whether women trust more easily than men. Adding such an effect would only indicate whether women or men have a left–right bias, but would not have any further substantive implication.[12] Subject characteristics can be used in interaction terms if one has specific hypotheses that, for example, the effect of uncertainty differs for more risk-averse subjects compared to less risk-averse subjects. Interaction terms have to be computed as differences of products of the respective values, because the combined value of the two variables determines the utility of the combination for a given vignette. The difference between the values of the two products affects the choice between the vignettes. The model does not include a constant, because a constant has also no substantive meaning and should theoretically not be included in the model. When including the constant, its value has to be interpreted as the a priori preference for a subject for the left or the right vignette. To make sure that there is no such bias, we did run a model including a constant term. In this model, the size of all effects and their significance level were almost identical to those of the model without the constant, and the constant itself was virtually equal to zero. Therefore, we do not present this model here. Standard errors are modified for clustering using the robust (Huber) estimator for clustered data (Rogers, 1993) because observations are not independent, each subject having to make 10 choices. See Buskens and Weesie (2000b) for a

slightly extended explanation of the specifics of the analysis strategy in a similar experiment and a more formal presentation of the argument that the constant should not be included in the model and main effects of subject characteristics not identified.

### Main Effects

Table 3 shows two probit models on the choice of the vignettes. Model 1 only includes the main effects, model 2 also interaction terms. Table 3 displays the marginal effects of the independent variables. Thus, a positive effect shows the corresponding increase in the probability that a vignette with value 1 on a given attribute is preferred over one with value 0 on that same attribute, ceteris paribus.

In model 1, most hypotheses on the main effects are supported. Attractiveness of a vignette decreases with *Partner Uncertainty*, because uncertainty about the partner has a negative effect on the probability that trust is placed. All formulations of information available to Ego have a positive significant effect, except for *Other Egos' Trustfulness vs Alter*. The effect of *Other Egos' Trustfulness vs Alter* has the expected positive sign, but it is not significant. Also the hypotheses about the difference between the coefficients are supported, i.e. the effects of information only about trustfulness of Other Egos (imitation) are smaller than the corresponding effects of trustworthiness of Alter or Other Alters (learning). The most surprising result is that imitation related to Other Alters has a larger effect than imitation related to 'Ego's own' Alter. Our explanation for this is that imitation is more likely for general patterns. There are actually two differences between the imitation variable related to Ego's Alter and Other Alters. Next to the obvious change from Ego's Alter to Other Alters, which is expected to cause a smaller effect, the formulation for Other Alters explicitly includes multiple Alters. This last change induces a more general signal that this type of interaction makes sense, which apparently causes a stronger imitation effect than the effect caused by just knowing that Other Egos trust your Alter. In addition, we see later that the effect of imitation related to Ego's Alter depends on the information Ego has about her Alter.[13]

As expected, *Future* has a positive significant effect on the attractiveness of a vignette, which is an effect of control via dyadic embeddedness. *Density* has a positive effect, but it is weakly significant. A possible explanation of this weak effect might be that the definition of *Density* = 1 in our scenario lacks an explicit connection to Ego. This is in contrast with *Outdegree*, which facilitates control via network embeddedness and provides one of the strongest positive effects. Thus, we find strong evidence for effects of learning and control through social networks on trust as well as some evidence for imitation.

***Table 3*** *Probit Models of the Choice of Vignettes (69 subjects, 690 observations)*

| Independent variable | Hyp. | Model 1 Marginal effect | Model 1 SE | Model 2 Marginal effect | Model 2 SE |
|---|---|---|---|---|---|
| *Partner Uncertainty* | – | –.18** | .043 | –.21** | .048 |
| *Trustworthiness of Alter* | + | .61** | .066 | .59** | .075 |
| *Trustworthiness of Other Alters* | + | .36** | .046 | .37** | .047 |
| *Other Egos' Trustfulness vs Alter* | + | .06 | .044 | .03 | .058 |
| *Other Egos' Trustfulness vs Other Alters* | + | .16** | .038 | .16** | .038 |
| *Future* | + | .20** | .035 | .20** | .035 |
| *Outdegree* | + | .23** | .037 | .23** | .037 |
| *Density* | + | .07* | .031 | .07* | .031 |
| *City* | 0 | –.02 | .038 | –.01 | .037 |
| Interaction effects | | | | | |
| *Partner Uncertainty* × *Trustworthiness of Alter* | + | | | .06 | .097 |
| *Partner Uncertainty* × *Other Egos' Trustfulness vs Alter* | + | | | .10 | .086 |
| *Knowledge* × *Trustworthiness of Alter* | – | | | –.07 | .062 |
| *Knowledge* × *Trustworthiness of Other Alters* | – | | | –.05 | .050 |
| *Knowledge* × *Other Egos' Trustfulness vs Alter* | – | | | –.03 | .039 |
| *Knowledge* × *Other Egos' Trustfulness vs Other Alters* | – | | | –.04 | .039 |
| *Partner Uncertainty* × *Risk aversion* | | | | –.00 | .002 |
| Tests of hypothesis 4 | | | | $\chi^2$ | *p* value |
| *Trustworthiness of Alter* > *Other Egos' Trustfulness vs Alter* | | | | 53.71 | .00 |
| *Trustworthiness of Other Alters* > *Other Egos' Trustfulness vs Other Alters* | | | | 25.71 | .00 |

**$p < .01$ and *$p < .05$ indicate two-sided significance based on Huber standard errors modified for clustering.

### *Interaction Effects with Subject Characteristics*

The first two interaction effects regard information and uncertainty about the partner's capacities. The interaction of *Partner Uncertainty* and *Trustworthiness of Alter* shows the expected sign, but the effect is very weak. Apparently, the value Ego attributes to this information does not

depend on how uncertain she is about Alter's competence. The interaction of *Partner Uncertainty* and *Other Egos' Trustfulness vs Alter* is not significant. However, we tested the contrast between no information and having information from *Other Egos' Trustfulness vs Alter* in combination with high uncertainty, and this is significant ($p = .04$). The test shows that the sum of these two effects is different from 0. This result supports that there is an effect of imitation, but that the effect only occurs under specific conditions, i.e. if Ego is uncertain about Alter's competence.

The following four interaction terms refer to the interaction between knowledge about the stock market and the information available from Other Egos. Although all these interactions are in the expected direction none of them is even close to significance. There are at least two explanations for this outcome. First, our design is not particularly suited to test effects of subject characteristics, because we only have 69 subjects. Thus, in this sense we have only 69 cases to test effects about interactions with subject characteristics. Second, the data show that most subjects had very limited knowledge about the stock market. Hardly any of them were able to give an accurate estimate of the Dutch AEX index, and only a couple had an approximate idea about the value of this index. If one wants to investigate these interactions further one should try to recruit subjects from a pool with more variance on knowledge about the stock market. Finally, we included an interaction term between partner uncertainty and risk aversion to check whether people with different risk preferences made different choices although we did not have a specific hypothesis on this. In principle, interaction terms between risk aversion and all vignette variables could be included in the analysis and we did run tests of all these interaction terms. However, individual preferences for any of the vignette variables did not vary according to risk aversion and adding such effects did not change any of the other effects. Thus, in order to show that, as far as our empirical results are concerned, risk aversion does not matter, we decided to include only one interaction term in Table 3, namely between risk aversion and partner uncertainty because partner uncertainty is formulated in terms of competence of Alter, and a less competent Alter intuitively implies a higher risk for Ego.

We tested also a range of interactions of other subject characteristics, just to be sure that there were no clear indications against our statistical assumption that the weights subjects assign to the different variables are the same among subjects. It turned out that we could not significantly improve on our model 1 by adding interactions with subject characteristics such as sex, age, birthplace, etc. We also found no differences between subjects who found the vignettes more or less realistic, or between subjects for whom the described scenario was closer or less close to their own actual situation.

## Conclusions

In this article, we provide a theoretical explanation for possible effects of imitation in trust problems. Imitative behaviour was incorporated in existing theories about the effects of social networks on trust as a particular form of learning by means of information accessible to Ego through the network. We described four different types of information in order to distinguish learning effects from imitation effects. This distinction is based on the information available to Ego about transactions among third parties in the past. On the one hand, if Ego is informed that Other Egos trusted Ego's partner (Alter) or other partners (Other Alters) and their trust was honoured, Ego can learn from this information. On the other hand, if Ego is only informed about Other Egos trusting Alter (or Other Alters) *without* knowing whether their trust was honoured, then Ego can imitate Other Egos. The importance of these types of information depends on Ego's uncertainty related to her trust problem with Alter. For example, she might be uncertain about the capacities of Alter and she might lack knowledge about the market in which her transaction with Alter takes place. We hypothesized that if Ego is more uncertain about her partner, she will value information about capacities more, while if she is more uncertain about the market, she will value any information about similar transactions more. We tested these hypotheses by means of a vignette experiment in which subjects had to choose between pairs of vignettes. The results confirmed that actors learn if they face trust problems with uncertainty. In addition, learning effects turn out to be larger than imitation effects as hypothesized. However, we did not find general support for the variations in importance of learning and imitation under more and less uncertainty. We only found a slight tendency that imitation of trustful behaviour is more important when uncertainty about the competence of the partner is larger. Conversely, if Ego has (positive) information about Alter's competence she does not imitate, but rather relies on, the partner's competence. Nevertheless, actors do imitate trusting behaviour if trusting behaviour seems to make sense in general, which is indicated by a significant effect of imitation of trusting behaviour of other Egos vs other Alters. Therefore, although imitation does not affect trust in every situation, our results support the idea that imitation should be considered among trust-breeding mechanisms. Furthermore, if imitation is particularly important when Ego is uncertain about Alter, a trusting environment is particularly important for newcomers.

For example, when new employees enter an organization, they will be more easily integrated if they find a trusting and cooperative environment, because they will 'learn' to trust their colleagues by imitating their behaviour. Moreover, imitation is particularly important for newcomers

also because other sources to build trust might not be immediately available to newcomers. The illustrations in this article have focused on horizontal relations between colleagues, but of course similar processes can be expected to build trust in other types of relations such as between managers and their subordinates. Not only knowing that a manager supports others in resolving their problems will increase Ego's trust (see Bijlsma and van de Bunt, 2003), but just observing that others ask a manager to help them solve a problem will increase Ego's trust although to a lesser extent than if Ego knows that appropriate help is provided.

Although some hypotheses were not supported by the data, the theoretical ideas underlying our hypotheses about individual behaviour in trust problems appeared to be promising and call for better tests. This article only represents a first attempt to distinguish imitation from learning theoretically as well as empirically. The inclusion of imitative behaviour and learning in one theoretical model undoubtedly constitutes a major task for future research. In addition, alternative empirical research is necessary for a more extensive test of such a theory. In this respect, a promising option for further research includes laboratory experiments using controlled networks. Networks could be created in which actors play trust games and exchange information at the same time. Then, information is not so much predetermined by the experimenter, but is created within the experiment. Such an experiment could provide the possibility to observe actual imitation at work (e.g. Barrera and Buskens, 2005). In such contexts, information cannot only be positive, but at times also negative. Therefore, this context can be used to study perverse effects of imitation. We would expect that if networks are dense and the flow of information is fast, small mistakes in the decision processes of actors facing trust problems could have large consequences. If actors base their decision on imitation, for example, it could happen that they trust the 'wrong' partner or that they mistrust the 'right' partner. Such mistakes are much more likely if uncertainty is high and the content of the information is limited, i.e. if imitation is the best option available for the actor.

Another improvement that could be included in the experiment is that uncertainty be more systematically varied between subjects, rather than looking at their expertise with respect to the specific trust problem as a potential element affecting the level of uncertainty. Moreover, one could think of other conditions in which imitation could be facilitated, e.g. if information is costly, subjects might be willing to buy information about the behaviour of others in similar roles, but might find it too expensive to buy the information of the outcomes of such transactions as well, leaving them with information that allows for imitation only. Finally, experimental tests are typically strong tests of formal social theories; however, they often lack possibilities for statements about external validity.

Therefore, it is important to investigate which real-life situations would be suitable to test our theory about imitation in trust situations with survey data.

## Appendix: Translation of the Instructions for the Vignette Experiment

Thanks for agreeing to participate in this experiment. As a reward for your cooperation you will receive €5 afterwards. This experiment is part of a research project on human decision-making. It is very important that you answer all questions carefully.

Read the instructions carefully. In the first part of the experiment, you are asked to imagine yourself in a hypothetical situation. You have to imagine that you want to ask someone to invest your money on the stock market. First, you will get a general description of this situation: The Scenario. Try to imagine that you are really in this situation. Thereafter, you have to choose between two persons whom you would let invest your money.

We want to stress that we want *your opinion*. There are no 'correct' or 'wrong' answers in this part of the experiment.

The second part of the experiment contains some questions about you. In principle, you can complete the experiment at your own. Nevertheless, if you still have questions, please ask the experiment leader.

### *The Scenario*

- You've recently had the idea of starting up a small e-business. You discovered a niche in the market and you want to jump into it quickly. Due to the very fast developments in this market, this has to happen fast otherwise the idea will probably become irrelevant.
- The bank where you try to get a loan to get the business going asks for a starting capital of €5000. You only have €3000 and with only your student allowance, you will not be able to obtain the €5000.
- Your parents are not prepared to lend you the rest of the money. They find the investment too risky and they are afraid that this business plan will distract you from your studies.
- Within your cohort you know two fellow students, named 'Jansen' and 'de Vries', who invest in the stock market themselves, and it seems that they are doing fairly well. You do not have enough knowledge about the stock market to make the investments yourself.
- You ask Jansen and de Vries and they tell you that you have a good chance of increasing your money from €3000 to €5000 if one of them invests the money on the stock market. The both ask for 10 percent of the profit if the investments turn out to be profitable.

- Jansen and De Vries both indicate that there are of course risks related to these kinds of investments and that unfortunately they cannot share in the losses if for whatever reasons the investments are not profitable.
- Although Jansen and De Vries are members of your cohort, you do not know them very well and you have never done this kind of business with them before.

### *The Task*

Imagine that, in spite of the risks involved, you decide to let Jansen or de Vries invest your money within the scenario given above. We provide you now with descriptions of Jansen and de Vries. For every pair of descriptions, we ask you to compare them and indicate which one you would prefer to do the deal. Even if the description does not match with your own situation, you have to try to imagine yourself in the situation as it is described. In addition, we ask that for every pair of descriptions you indicate how strong your preference is for the chosen fellow student. You can indicate your choices by marking the relevant boxes. You will be asked these two questions for *10* different pairs of descriptions. *The scenario given above applies to all pairs of descriptions*. Do not hesitate to read the scenario again if this helps to make your choices.

## Notes

Useful suggestions and comments by Werner Raub, Jeroen Weesie, Chris Snijders, Ronald Batenburg, Tom Snijders, Rafael Wittek, Andreas Flache, Christian Steglich and Patricia van Echtelt are gratefully acknowledged. This article is part of the research programme 'Management of Matches' funded by the Netherlands Organization for Scientific Research (NWO) under grant PGS 50-370. Buskens' contribution is part of the project 'Third-Party Effects in Cooperation Problems' of the Royal Netherlands Academy of Arts and Sciences (KNAW).

1. For reader friendliness and in correspondence with conventional use of pronouns in the literature, we use female gender for Ego and male for Alter.
2. We use here a rather restrictive definition of control, namely the extent to which the long-term relation between Ego and Alter can be expected to affect Alter's behaviour. Often control is defined more generally in terms of processes through which Ego can affect the behaviour of Alter (see, for example, Das and Teng, 1998).
3. In Dutch universities a cohort of students is called *jaargroep* (literally year group) and consists of all students that begin a given curriculum of studies in the same year. Typically, unless the group is too numerous, they all know each other and form a rather cohesive group.
4. This setting does not allow for an 'exit' option. We are only interested in which Alter the subjects choose after the decision is made to do the deal with

at least one of the two partners. We do not know whether the subjects find either of the two subjects a reasonable option for such a transaction at all.

5. Jansen and de Vries are two of the most common Dutch surnames; we expect no preference for one or the other name.
6. Some of the characteristics (such as variables concerning the type of information available to Ego, for example) do not refer specifically to a person, but more generally to a situation; nonetheless we have no reason to expect subjects to evaluate this information incorrectly.
7. In order to have all cases included in our analysis, missing values of the factor score were imputed with the best possible prediction from the data available for the variables that were used to construct the factor score using the command impute in Stata 8.
8. Five items were included and for each item we calculated the deviation between the value of the lottery for the subject and the risk-neutral value. Cronbach's alpha on these items was .88 so we summed the five deviations as a measure for risk aversion.
9. A vignette can be represented by a vector $x = (x_1, x_2, x_3, x_4, x_5, x_6)$ where $x_i$ represents the $i^{th}$ variable of the vignette. A Pareto ordering can be defined for a pair $(x, y)$ of vignettes such that $x \geq y$ if, and only if, $x_i \geq y_i$ for all $i = 1, \ldots, 6$.
10. *City* is incorporated with *Partner Uncertainty,* which has three categories; this restriction excludes two of the six possible combinations.
11. This answer was used to transform preference into a scale, which was subsequently used as dependent variable to estimate subjects' choice with an ordinary least squares regression model. However, these results are not presented in the fourth section because they were not substantially different from the results that are presented.
12. There are no indications that such biases exist in our data.
13. Barrera and Buskens (2005) tested a set of similar hypotheses on effects of learning and imitation using a laboratory experiment in which subjects played repeated trust games and received information about choices made by other subjects. They found that imitation of the behaviour of other subjects paired with a different partner influences Ego's own behaviour only if no better information – for example about Alter – is available to her.

## References

Axelrod, R. (1984) *The Evolution of Cooperation.* New York: Basic Books.

Bandura, A. and Walters, R. H. (1963) *Social Learning and Personality Development.* New York: Holt, Rinehart and Winston.

Barrera, D. (2005) *Trust in Embedded Settings.* Veenendaal: Universal Press.

Barrera, D. and Buskens, V. (2005) 'Third-Party Effects in an Embedded Investment Game.' ISCORE paper 226, Utrecht University.

Bijlsma, K. M. and van de Bunt, G. G. (2003) 'Antecedents of Trust in Managers: A "Bottom-Up" Approach', *Personnel Review* 32: 638–64.

Burt, R. S. (2001) 'Bandwidth and Echo: Trust, Information and Gossip in Social Networks', in J. E. Rauch and A. Casella (eds) *Networks and Markets: Contributions from Economics and Sociology*, pp. 30–74. New York: Russell Sage Foundation.

Burt, R. S. and Knez, M. (1995) 'Kinds of Third-Party Effects on Trust', *Rationality and Society* 7: 255–93.
Buskens, V. (2002) *Social Networks and Trust.* Dordrecht and Boston, MA: Kluwer.
Buskens, V. and Raub, W. (2002) 'Embedded Trust: Control and Learning', *Advances in Group Processes* 19: 167–202.
Buskens, V. and Weesie, J. (2000a) 'Cooperation via Social Networks', *Analyse & Kritik* 22: 44–74.
Buskens, V. and Weesie, J. (2000b) 'An Experiment on the Effects of Embeddedness in Trust Situations: Buying a Used Car', *Rationality and Society* 12: 227–53.
Buskens, V. and Yamaguchi, K. (1999) 'A New Model for Information Diffusion in Heterogeneous Social Networks', in M. Becker and M. Sobel (eds) *Sociological Methodology*, pp. 281–325. Oxford: Blackwell.
Buskens, V., Raub, W. and Snijders, C. (2003) 'The Governance of Relations in Markets and Organizations', *Research in the Sociology of Organizations* 20: 1–18.
Byrne, R. W. and Russon, A. E. (1998) 'Learning by Imitation: A Hierarchical Approach', *Behavioral and Brain Sciences* 21: 667–721.
Camerer, C. and Weigelt, K. (1988) 'Experimental Tests of a Sequential Equilibrium Reputation Model', *Econometrica* 56: 1–36.
Coleman, J. (1990) *Foundations of Social Theory.* Cambridge, MA: The Belknap Press of Harvard University Press.
Costa, A. C. (2000) 'A Matter of Trust: Effects on the Performance and Effectiveness of Teams in Organizations', PhD thesis, University of Tilburg.
Costa, A. C., Roe, R. A. and Taillieu, T. (2001) 'Trust within Teams: The Relation with Performance Effectiveness', *European Journal of Work and Organisational Psychology* 10: 225–44.
Das, T. K. and Teng, B.-S. (1998) 'Between Trust and Control: Developing Confidence in Partner Cooperation in Alliances', *Academy of Management Review* 23: 491–512.
Dasgupta, P. (1988) 'Trust as a Commodity', in D. Gambetta (ed.) *Trust: Making and Breaking Cooperative Relations*, pp. 49–72. Oxford: Blackwell.
Dirks, K. T. (1999) 'The Effects of Interpersonal Trust on Work Group Performance', *Journal of Applied Psychology* 84: 445–55.
Donkers, B., Melenberg, B. and van Soest, A. (2001) 'Estimating Risk Attitudes Using Lotteries: A Large Sample Approach', *The Journal of Risk and Uncertainty* 22: 165–95.
Ellison, G. and Fudenberg, D. (1995) 'Word-of-Mouth Communication and Social Learning', *The Quarterly Journal of Economics* 110: 93–125.
Erev, I. and Roth, A. E. (1998) 'Predicting How People Play Games: Reinforcement Learning in Experimental Games with Unique, Mixed Strategy Equilibria', *The American Economic Review* 88: 848–81.
Gautschi, T. (2000) 'History Effects in Social Dilemma Situations', *Rationality and Society* 12: 131–62.
Granovetter, M. S. (1985) 'Economic Action and Social Structure: The Problem of Embeddedness', *American Journal of Sociology* 91: 481–510.
Hedström, P. (1998) 'Rational Imitation', in P. Hedström and R. Swedberg (eds) *Social Mechanism: An Analytical Approach to Social Theory*, pp. 306–27. Cambridge: Cambridge University Press.

Kahneman, D. and Tversky, A. (1979) 'Prospect Theory: An Analysis of Decision under Risk', *Econometrica* 47: 263–92.
Kollock, P. (1994) 'The Emergence of Exchange Structures: An Experimental Study of Uncertainty, Commitment and Trust', *American Journal of Sociology* 100: 313–45.
Kreps, D. M. (1990) 'Corporate Culture and Economic Theory', in J. Alt and K. Shepsle (eds) *Perspective on Positive Political Economy*, pp. 90–143. Cambridge: Cambridge University Press.
McFadden, D. (1973) 'Conditional Logit Analysis of Qualitative Choice Behavior', in P. Zarembka (ed.) *Frontiers in Econometrics*, pp. 105–42. New York: Academic Press.
Macy, M. W. (1990) 'Learning Theory and the Logic of Critical Mass', *American Sociological Review* 55: 809–26.
Nooteboom, B. (2002) *Trust: Forms, Foundations, Functions, Failures and Figures.* Northampton, MA: Edward Elgar.
Pingle, M. (1995) 'Imitation versus Rationality: An Experimental Perspective on Decision Making', *Journal of Socio-Economics* 24: 281–316.
Pingle, M. and Day, R. H. (1996) 'Modes of Economizing Behavior: Experimental Evidence', *Journal of Economic Behavior and Organization* 29: 191–209.
Podolny, J. M. (1993) 'A Status-Based Model of Market Competition', *American Journal of Sociology* 98: 829–72.
Podolny, J. M. (2001) 'Networks as Pipes and Prisms of the Market', *American Journal of Sociology* 107: 33–60.
Raub, W. and Snijders, C. (1997) 'Gains, Losses, and Cooperation in Social Dilemmas and Collective Action: The Effects of Risk Preferences', *Journal of Mathematical Sociology* 22: 263–302.
Raub, W. and Weesie, J. (1990) 'Reputation and Efficiency in Social Interactions: An Example of Network Effects', *American Journal of Sociology* 96: 626–54.
Raub, W. and Weesie, J. (2000) 'The Management of Matches: A Research Program in Durable Social Relations', *The Netherlands Journal of Social Science* 36: 71–88.
Rogers, W. M. (1993) 'Regression Standard Errors in Clustered Samples', *Stata Technical Bulletin* 13: 19–23.
Rooks, G., Raub, W., Selten, R. and Tazelaar, F. (2000) 'How Inter-Firm Cooperation Depends on Social Embeddedness: A Vignette Study', *Acta Sociologica* 43: 123–37.
Rossi, P. H. and Nock, S. L., eds (1982) *Measuring Social Judgments: The Factorial Survey Approach.* Beverly Hills, CA: Sage.
Schlag, K. (1998) 'Why Imitate, and If So, How? A Bounded Rational Approach to Multi-Armed Bandits', *Journal of Economic Theory* 78: 130–56.
Snijders, C. (1996) *Trust and Commitments.* Amsterdam: Thela Thesis.
Wittek, R. (2001) 'Mimetic Trust and Intra-Organizational Network Dynamics', *Journal of Mathematical Sociology* 25: 109–38.

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